# LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES

OFFICE OF FISHERIES
INLAND FISHERIES SECTION

PART VI -B

WATERBODY MANAGEMENT PLAN SERIES

# BLACK BAYOU LAKE
# (Caddo Parish)

WATERBODY EVALUATION &
RECOMMENDATIONS

# CHRONOLOGY

DOCUMENT SCHEDULED TO BE UPDATED ANNUALLY

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# WATERBODY EVALUATION

## STRATEGY STATEMENT

Recreational

Sportfish species are managed to provide a sustainable population while providing anglers the opportunity to catch or harvest numbers of fish adequate to maintain angler interest and efforts. Bass anglers are afforded the opportunity to catch an occasional trophy fish through the introduction of Florida largemouth bass.

Commercial

There is limited commercial fishing activity due to the low population of most commercial species. The commercial fisheries strategy for Black Bayou Lake is to allow harvest of commercial fish species to the extent possible given the physical characteristics of the lake and to the extent that conflicts with other user groups are minimized.

Species of Special Concern

No threatened or endangered fish species are found in this waterbody.

## EXISTING HARVEST REGULATIONS

Recreational

Statewide regulations for all fish species see link below:

http://www.wlf.louisiana.gov/fishing/regulations

Commercial

Statewide regulations on all species see link below:

http://www.wlf.louisiana.gov/fishing/regulations

Fishing Gear

No additional restrictions beyond statewide regulations have been implemented.

Parish Regulations

None

## SPECIES EVALUATION

Recreational

Black Bayou Lake has been sampled periodically with various types of gear over the years, but has not been the subject of extensive fisheries sampling. Rotenone sampling was used exclusively from 1973 through 1993 to estimate annual biomass of the total fish population. Spring electrofishing samples were conducted in 1993, 1997, 2000, 2005, and 2008 to collect information specifically on largemouth bass and crappie populations. Fall electrofishing samples and forage samples were conducted in 1994, 1996, and 2008. Gill net sampling was conducted in 2001, 2005, and 2011 to sample larger-bodied fish and to monitor commercial species of fish (e.g., bowfin, common carp).

*Largemouth Bass*

Largemouth bass (*Micropterus salmoides*) are targeted for evaluation since they are indicative of the overall fish population due to their high position in the food chain. Electrofishing is the best indicator of largemouth bass abundance and size distribution, with the exception of large fish (i.e.,> 5 lbs.). Sampling with gill nets provides better assessment of large bass and other large-bodied fish species. Biomass (rotenone) sampling was used exclusively to sample the fisheries population on Black Bayou Lake. Figure 1 below indicates the standing crop estimates of largemouth bass in pounds per acre from 1973 up until 1993. There may be a slight decrease in the standing crop of largemouth bass on Black Bayou Lake during the period sampled, but at no point was the standing crop very high as the yearly average standing crop rose above 5 pounds per acre in only 3 of the 9 years sampled. Black Bayou Lake is an old reservoir, impounded in 1945. Reservoirs tend to produce the greatest biomass of fish in the first 4 to 5 years following impoundment. Productivity then tends to decrease as fertility of the impoundment decreases. Management strategies such as drawdowns or liming and fertilizing are utilized to temporarily increase productivity in a reservoir. These measures generally do not increase productivity to the point the reservoir was at its peak.

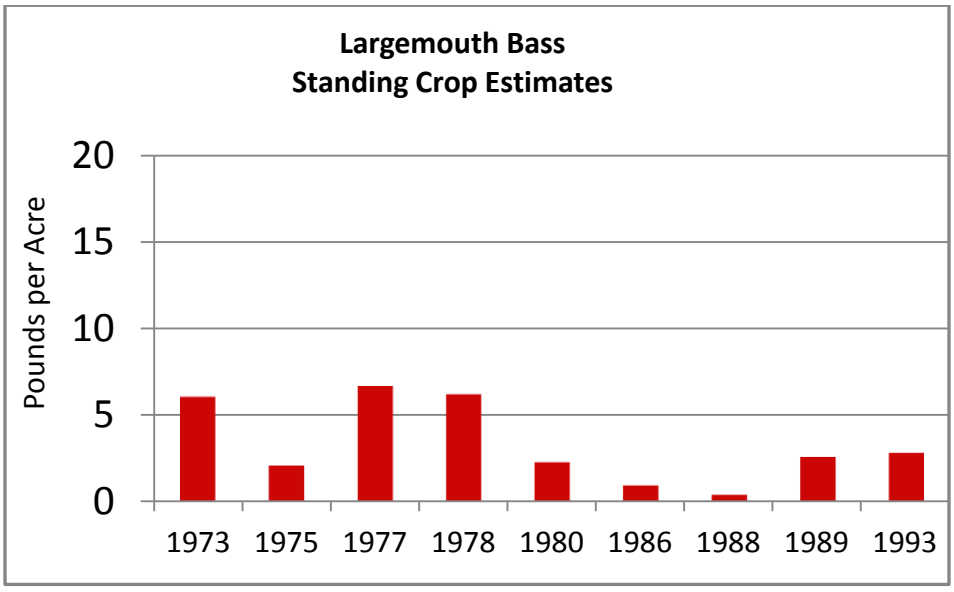


Figure 1. Average pounds per acre of largemouth bass collected from biomass (rotenone) sampling in Black Bayou Lake, LA from 1973 to 1993.

Catch Per Unit Effort and Size Distribution-

Electrofishing has been the primary sampling technique utilized on Black Bayou Lake in recent years. Results from spring electrofishing samples for stock-size (i.e., total length ≥ 8 in.) largemouth bass from 1993 – 2008 are presented in Figure 2 below. The sample taken in the spring of 2000 had a significantly higher CPUE than other samples.

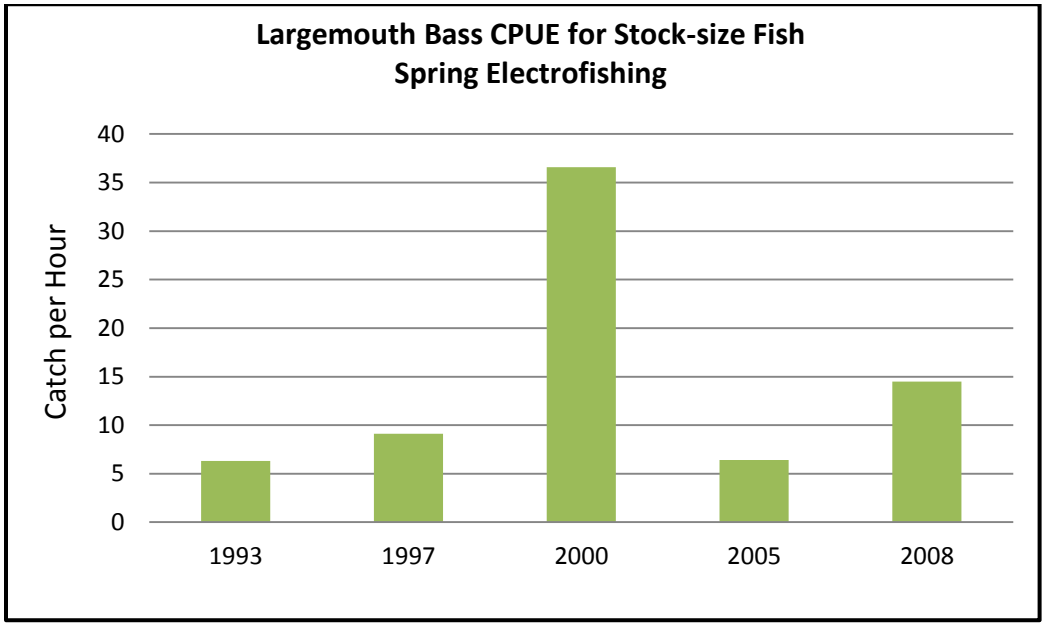


Figure 2. Spring electrofishing catch-per-unit-of-effort (CPUE) for stock-size (8" and up) largemouth bass on Black Bayou Lake, LA from 1993-2008.

CPUE for stock-size largemouth bass from the fall electrofishing samples are shown in Figure 3 below. From available data, it is difficult to conclude that there has been significant change in the population of stock-size largemouth bass in the time period of 1993 to 2008.

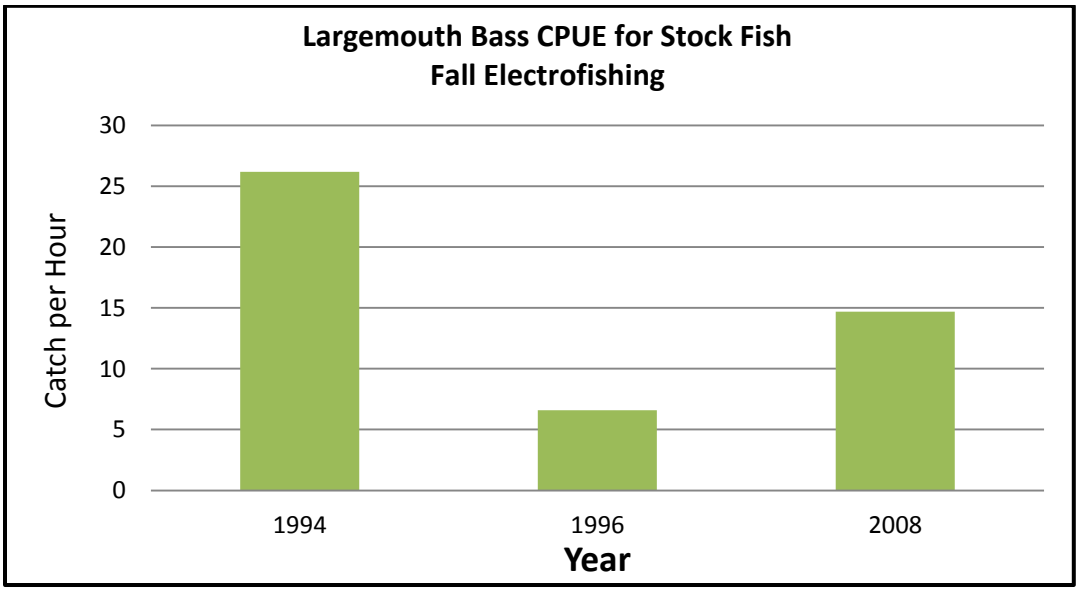


Figure 3. Catch-per-unit-of-effort (CPUE) for stock-size (8" and up) largemouth bass collected during fall electrofishing sampling on Black Bayou Lake, LA from 1994-2008.

Proportional stock density (PSD) and relative stock density (RSD) are indices used to numerically describe size-distribution (length) data. Proportional stock density compares the number of fish of quality-size (greater than 12 inches for largemouth bass) to the number of bass of stock-size [greater than 8 inches in total length (TL)]. The PSD is expressed as a percentage. A fish population with a high PSD consists mainly of larger individuals, whereas a population with a low PSD consists mainly of smaller fish. Relative stock density compares the number of fish of a given size range to the number of bass of stock size. A common calculation used in fisheries management is for RSD-Preferred (RSD-P). This value compares the number of largemouth bass > 15 inches TL to the number of stock-size largemouth bass in the population. This is also commonly called RSD-15 values. Values for PSD and RSD – Preferred (> 15 inches in TL) from the spring electrofishing samples are shown in Figure 4 below. Ideal PSD and RSD-P values for largemouth bass range from 40-70 and 10-40, respectively. The spring electrofishing samples indicate that there may have been a minor increase in PSD in Black Bayou Lake from the period 1993 to 2008, but no significant increase or decrease in preferred-size fish. This suggests that fish between 12-15 inches during spring have increased proportionately since 1993, but the proportion of fish > 15 in. has leveled off.

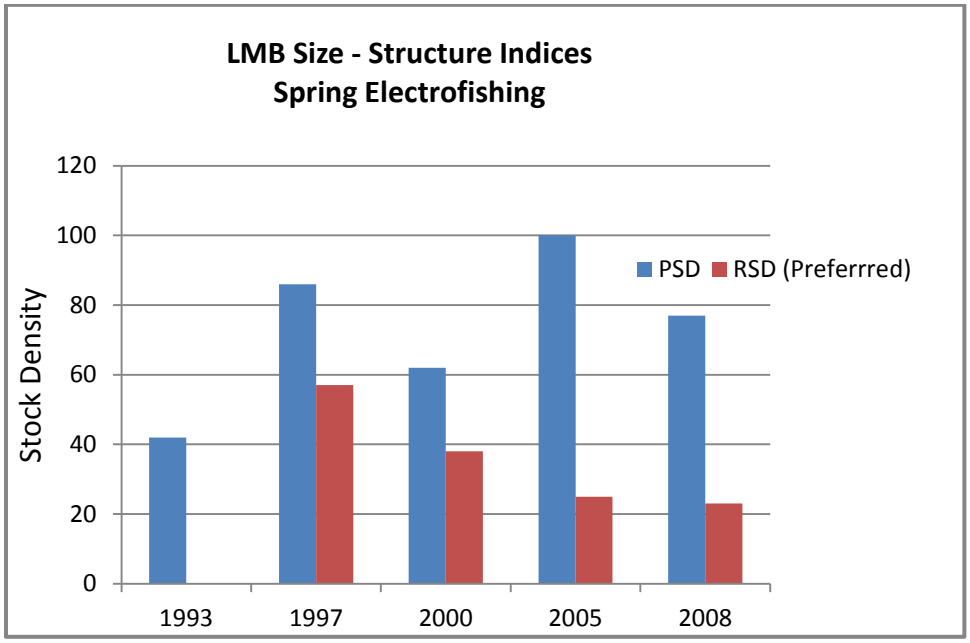


Figure 4. Size-structure indices for largemouth bass on Black Bayou Lake, LA, from 1993 to 2008 for spring electrofishing samples.

Standardized gill net sampling conducted on Black Bayou Lake may provide insight into the population of larger size largemouth bass not revealed with electrofishing sampling. Largemouth bass captured in gill nets during sampling in 2001, 2005, and 2011 are depicted in Figure 6 below. The results indicate a significant increase in the number of memorable and trophy size largemouth bass than from previous years. Anglers also now report catching larger fish. The percentage of the Florida genetic introgression in the bass population was indicated as 24% in the 2008 genetic sample.

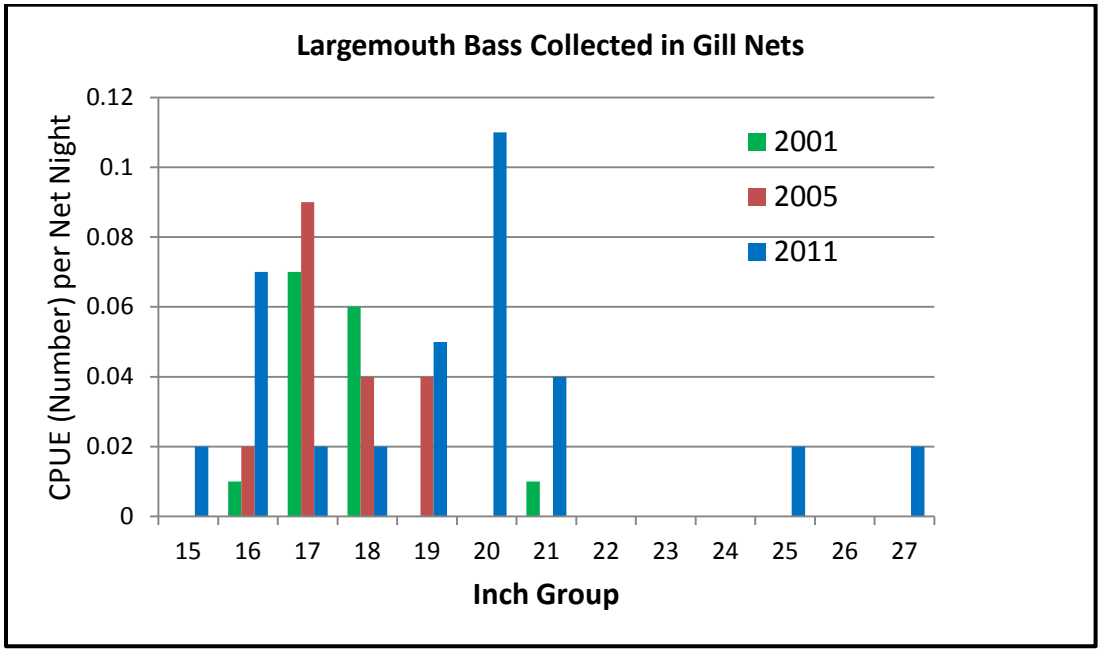


Figure 6. The CPUE (number) per net night (100' net) of largemouth bass (*Micropterus salmoides*) collected during standardized gill net sampling on Black Bayou Lake (Caddo Parish), LA, during 2001, 2005, and 2011.

There was a significant increase in the number of largemouth bass > 20 inches TL in the 2011 sample.

*Forage*

Forage availability is measured directly through fall forage electrofishing results and indirectly through measurement of largemouth bass body condition or relative weight (Wr). Relative weight is the ratio of a fish's weight to the weight of a ''standard'' fish of the same length. The Wr index is calculated by dividing the weight of a fish by the standard weight for its length, and multiplying the quotient by 100. Largemouth bass Wr below 80 indicate a potential problem with forage availability.

Figure 7 illustrates the relative weight (Wr) for stock-size and larger fish collected during fall electrofishing samples in 1994, 1996, and 2008. The relative weights were all above 90 which indicates that forage availability was adequate during this time period.

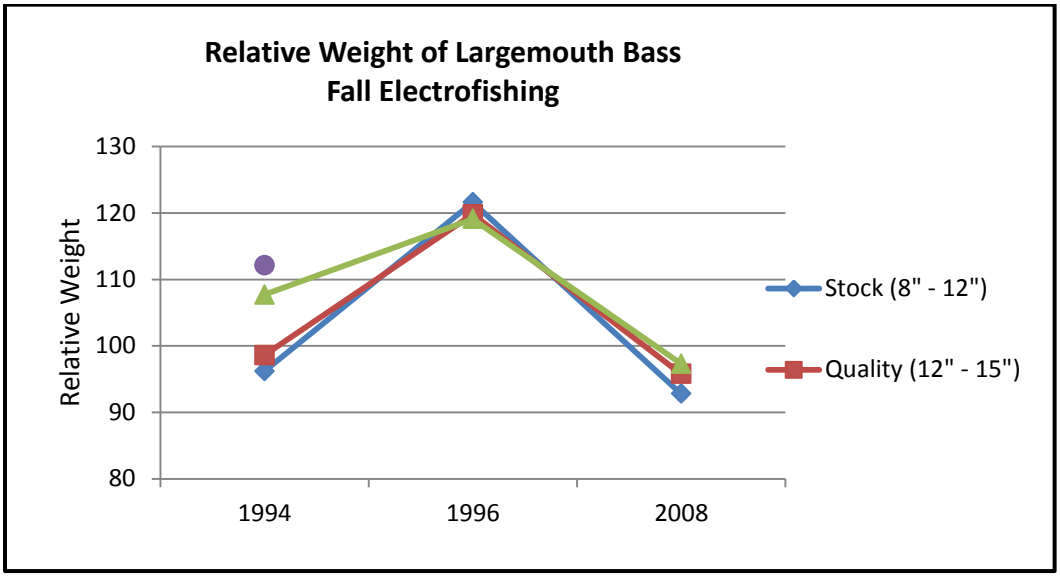


Figure 7. Relative weights of largemouth bass by size group collected during fall electrofishing from Black Bayou Lake, LA, from 1994 to 2008.

Relative weights were above 90 and indicate that abundant forage was available for these size groups of largemouth bass during this period.

Forage samples were collected in conjunction with fall electrofishing samples in 1994, 1996 and 2008. Only fishes $\leq$ 5 inches TL are considered as forage for the purpose of evaluating the available forage in the reservoir. *Lepomis spp.* and fishes in the "Forage" category which consisted primarily of threadfin shad (*Dorosoma petenense*) and brook silversides, (*Labidesthes sicculus*) comprised the majority of the forage collected in the 1994 sample (Figure 8). Samples collected in subsequent years contained significantly lower numbers of these species of fishes $\leq$ 5 inches TL which would be available as forage for largemouth bass. High numbers of juvenile largemouth bass and black crappie (*Pomoxis nigromaculatus*) were collected during the 1996 sample indicating good reproduction following the drawdown in 1995. Numbers of fish collected in the 2008 forage sample were alarmingly low with only 9 individuals of all species of fish collected during the 15 minute sample; this is likely due to the poor habitat in the upper end of the lake where the 2008 forage sample was conducted. The good condition of bass, as measured by their relative weights, does not coincide with the poor forage availability.

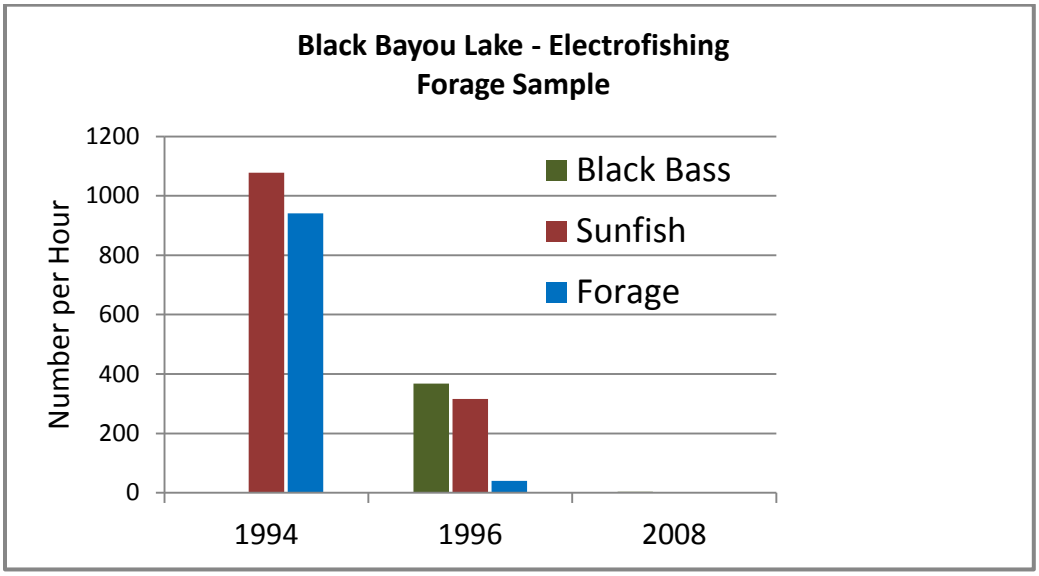


Figure 8. The CPUE in number per hour of fishes ≤ 5 inches TL from forage samples captured in Black Bayou Lake, (Caddo Parish), LA in 1994, 1996 and 2008.

Sunfish, threadfin shad, and brook silversides comprised the majority of the species available as forage in the sample collected in 1994. Subsequent samples contained significantly lower numbers of forage species, but high numbers of largemouth bass and black crappie were collected in the 1996 sample. Numbers from the 2008 sample are too small to be depicted by the graph.

*Lepomis spp.*, along with threadfin shad comprised the majority of the biomass collected in these samples with nearly 7.7 pounds of bream ≤ 5 inches TL captured in the fall 1994 forage sample and approximately 13.4 pounds collected in the 1996 sample (Figure 9). Approximately 10.5 pounds of thread fin shad accounted for the majority of the forage fish collected in the 1994 sample.

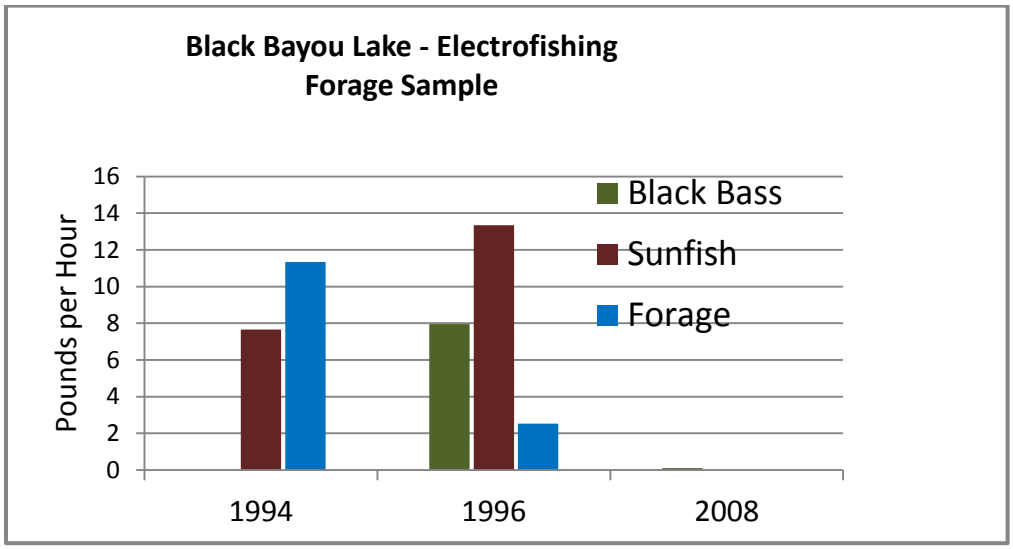


Figure 9. The CPUE in pounds per hour of fishes ≤ 5 inches TL from forage samples captured in Black Bayou Lake, (Caddo Parish), LA in 1994, 1996 and 2008.

Sunfish comprised the largest component by weight of the available forage in the lake. Fishes in the "Forage" category consisted primarily of threadfin shad.

*Crappie*

Crappie collected during biomass (rotenone) sampling conducted from 1973 to 1993 consisted primarily of black crappie (*Pomoxis nigromaculatus*) as only a few individuals of white crappie (*Pomoxis annularis*) were collected. The CPUE of crappie averaged a relatively low 1.6 pounds per acre. Little change in the crappie population was observed during the period in which biomass sampling was conducted (Figure 10).

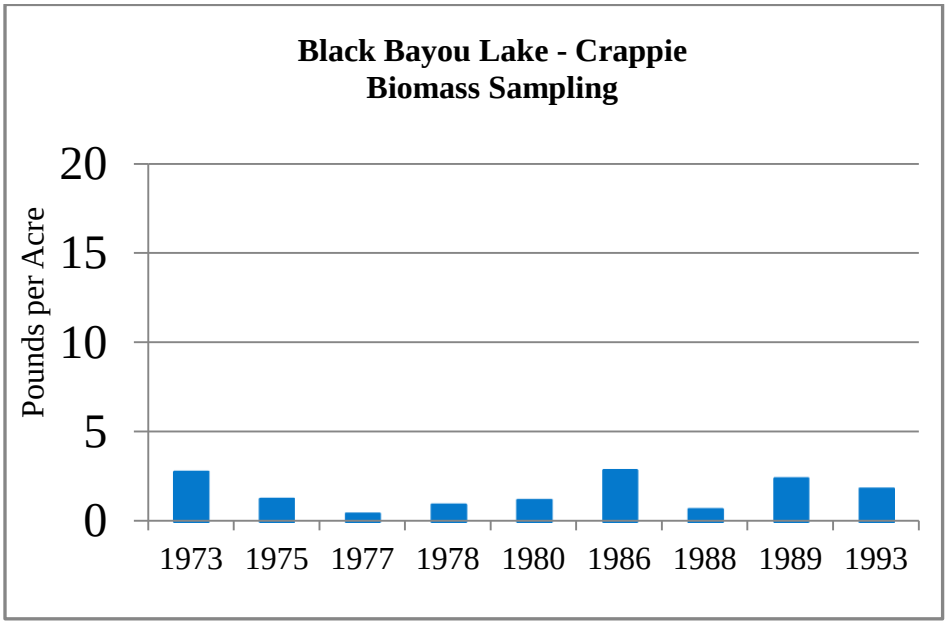


Figure 10. The CPUE in pounds per acre of crappie collected from Black Bayou Lake (Caddo Parish), LA, during biomass (rotenone) sampling from 1973 to 1993.

The sampling revealed no significant change in the crappie population which averaged a relatively low 1.6 pounds per acre. The population consists primarily of black crappie

Few crappie were collected during spring and fall electrofishing samples from 1993 – 2008 as depicted in Figure 11. The population consisted primarily of black crappie as no white crappie were collected with electrofishing gear during the years sampled. Large numbers of small black crappie were collected during the fall 1996 sample indicating good reproduction following the drawdown in 1995.

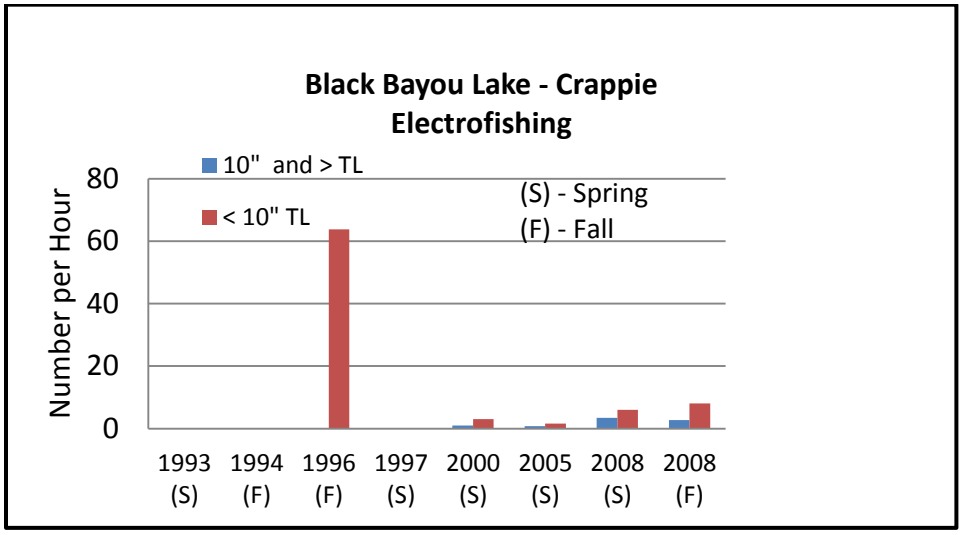

Figure 11. CPUE of crappie collected from Black Bayou Lake, LA from 1993 to 2008.

Overall numbers were low and no crappies were collected in several of the samples. Black crappie is the predominant species in the reservoir as no white crappie were collected with electrofishing gear during the years sampled.

Commercial

Historical biomass sampling on Black Bayou Lake indicates that while several commercial species such as freshwater drum (*Aplodinotus grunniens*), channel catfish (*Ictalurus punctatus*), spotted gar (*Lepisosteus oculatus*), and bigmouth buffalo (*Ictiobus cyprinellus*); were present in the lake they were not particularly abundant (Figure 12).

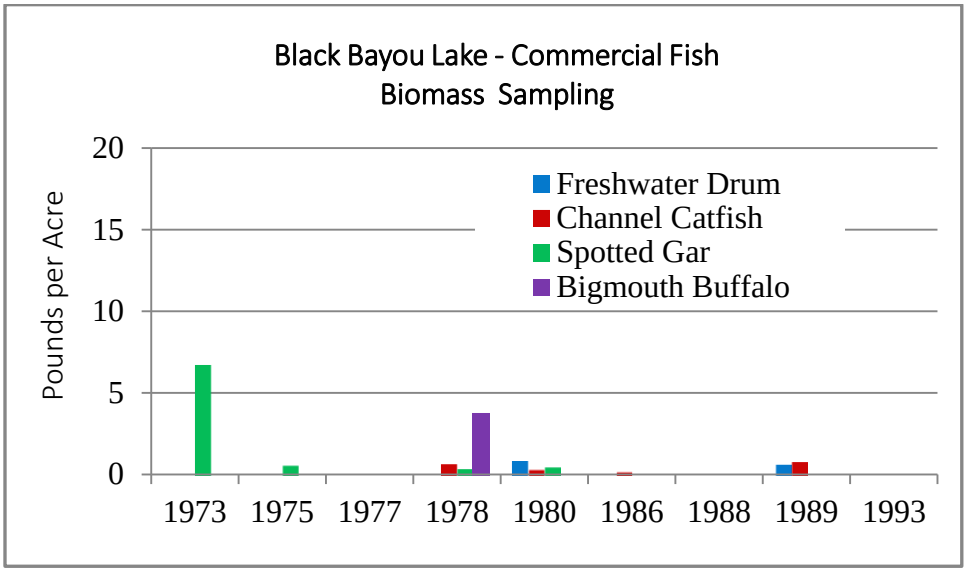


Figure 12. CPUE of commercial fish collected in Black Bayou Lake (Caddo Parish), LA, from 1973 to 1993.

Gill nets-

Standardized sampling with gill nets was conducted on the lake in 2001, 2005, and 2011. The CPUE of smallmouth buffalo (*Ictiobus bubalus*) increased significantly in the 2011 sample (Figure 13). Currently there is limited commercial fishing activity on Black Bayou Lake; gill nets are used by one or two commercial fishermen during the late winter and early spring to target the buffalo in the lake. This activity takes place when the submerged aquatic vegetation is at low densities as the remainder of the year the aquatic vegetation is not conducive to fishing commercial gear in the lake. The numerous stumps and the cypress / tupelo forest also hinder commercial fishing activities on the lake.

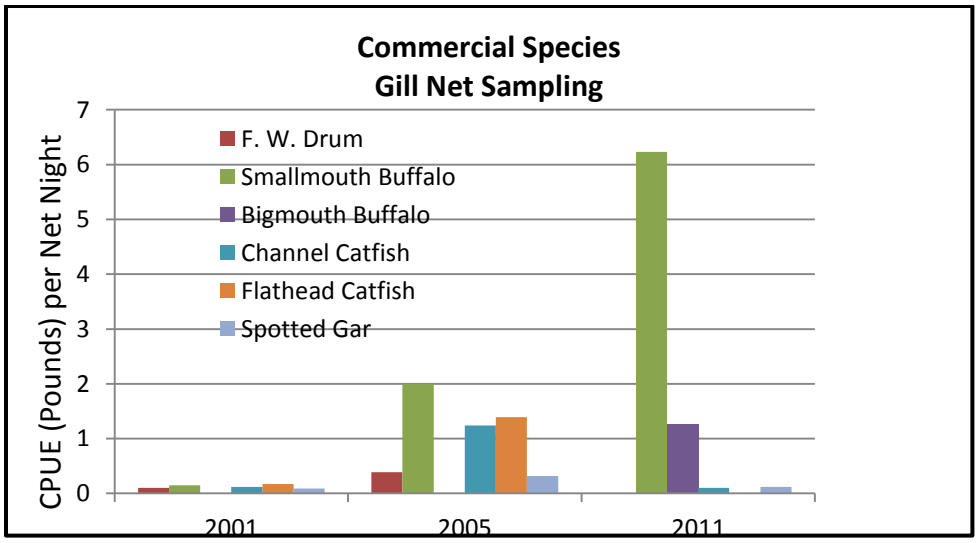


Figure 13. CPUE in Black Bayou Lake (Caddo Parish) for sample years 2001, 2005, and 2011.

The CPUE of smallmouth buffalo increased significantly during the sampling period.

## HABITAT EVALUATION

### Aquatic Vegetation

The upper half of the Black Bayou Lake is a dense cypress / tupelo forest, while the lower half of the lake contains scattered cypress trees and stumps from the bottomland hardwood forest prior to impoundment. Black Bayou Lake has extensive areas of shallow water that are susceptible to aquatic vegetation infestations. Emergent and submersed aquatic vegetation has been problematic in the lake since impoundment in 1945. In 1955, the lake level was raised 4 feet in an effort to combat aquatic vegetation and improve fishing. The submerged aquatic vegetation problem persisted after this increase in pool level.

Overabundant aquatic vegetation is common for shallow water in Louisiana. Emergent species such as water primrose (*Ludwigia octovalvis*), fragrant water lily (*Nymphaea odorata*), American Lotus (*Nelumbo lutea)* and alligator weed (*Alternanthera philoxeroides*) are typically present in severe to moderate infestations in this reservoir. Hydrilla (*Hydrilla verticillata*), fanwort (*Cabomba caroliniana*), bladderwort (*Utricularia spp*.) and coontail (*Ceratophyllum demersum*) are the most troublesome submersed species. Water clarity of Black Bayou allow for growth to depths of 7 to 8 feet. Major floating plants include giant salvinia (*Salvinia molesta*), water hyacinth (*Eichhornia crassipes*), duckweed (*Lemna spp*.), and watermeal (*Wolffia spp*.).

Hydrilla was first observed in Black Bayou around 2001. The initial infestation was located in the immediate area of the boat ramp and fishing pier at Robert L. Nance Park. Granular herbicide applications were promptly made. After the initial colonization period, hydrilla continues to expand and displace native submerged aquatic vegetation. This species now covers a large portion of the lake and has a very significant negative effect on fishing and boating access.

An aquatic vegetation type map survey, conducted in November, 2006, showed that aquatic vegetation covered approximately 75% of Black Bayou Lake. Giant salvinia was first documented in 2007 on the lake. The coverage of giant salvinia was kept in check for several years by competition with the established aquatic vegetation as well as with foliar herbicide applications. Recently coverage has expanded to the point where nearly the entire upper end of the lake is covered with giant salvinia.

Another type map survey which was conducted in June of 2009, indicated approximately 80% of the lake was infested with aquatic vegetation. However, by the fall of 2011, estimates indicated that 90% of Black Bayou Lake was infested with submerged aquatic vegetation. The infestation was comprised predominately of hydrilla, fanwort, bladderwort, and coontail. Large mats of water hyacinth mixed with giant salvinia were found on the upper end of the lake.

### Substrate

The substrate of Black Bayou Lake is composed of moderately to poorly drained loam. Organic content is generally high throughout the lake due to accumulations from abundant aquatic vegetation and annual leaf fall contributions from the dense cypress / tupelo forests in

the upper end of the lake. Suitable fish spawning substrate is limited along the shoreline of the lower end of the lake.

Complex Cover

Complex cover in Black Bayou Lake consists primarily of stumps, aquatic vegetation, scattered cypress trees, piers and boathouses in the lower end of the lake. The primary complex cover in the upper end is the dense cypress / tupelo forest in addition to aquatic vegetation along with some piers and boathouses.

## CONDITION IMBALANCE / PROBLEM

Black Bayou Lake is typical of many impounded natural swamps in that eutrophication has been accelerated by an altered hydrological regime. Aquatic vegetation and leaf litter from the dense forest canopy combine to contribute many tons of organic matter to the lake bed annually. In a natural swamp, periods of low water in the late summer/early fall allow for decomposition of organic matter through the process of aerobic decomposition. Aerobic decomposition requires oxygen and occurs at a significantly higher rate than anaerobic decomposition. Without exposure to air, leaf litter and dead aquatic vegetation decompose through the much slower process of anaerobic decomposition. When the anaerobic process cannot keep pace with annual contributions of organic material, excess material accumulates. Declines in water quality and fish productivity are associated with organic material accretion.

Excessive aquatic vegetation has been a chronic problem in Black Bayou Lake since impoundment. In 1955, the spillway was raised 4 feet in an effort to reduce aquatic vegetation and improve fisheries. The action was not successful. The problem of excessive aquatic vegetation has become even more acute with the introduction of non-native invasive species, including egeria, hydrilla, and giant salvinia. Currently hydrilla covers the majority of the lower lake and giant salvinia covers nearly the entire upper third of the lake.

## CORRECTIVE ACTION NEEDED

Controls for aquatic vegetation are generally categorized into three broad groups; chemical, physical, and biological. Because of the tremendous expense associated with chemical treatments to submerged vegetation, LDWF herbicide applications are primarily confined to emergent species (i.e., water hyacinth, alligator weed, and salvinia).

Physical controls include actions to contain and even harvest vegetation, but the most common involves water fluctuation. Water fluctuations that mimic the historic water level regime of Black Bayou could provide habitat improvement. In consideration of shoreline property owners, springtime high water levels would not be intentionally duplicated. However, low water periods that naturally occur in the late summer and fall are duplicated with drawdowns.

A review of Black Bayou Lake drawdowns reveals that benefits have been inconsistent. Table 4 in MP-A provides evidence that local weather factors are a primary influence to the outcome of drawdowns as a management action. Unseasonable weather, including heavy

rainfall or warm winter temperatures has undermined the success of some efforts. Benefits have also been enhanced due to weather. Low rainfall and cold winter temperatures during the 1996-97 drawdown provided increased aquatic vegetation control. Such unpredictable and uncontrollable factors should simply be acknowledged as a possibility with each drawdown proposal. Drawdowns timed to mimic the natural annual hydrologic regime remain as the most prudent action to achieve desired benefits with regard to fisheries management and habitat improvement.

The maximum drawdown capability of Black Bayou Lake is limited to 6 feet below normal pool elevation due to sediment accumulations near the control structure. Louisiana Department of Transportation and Development (DOTD) are currently evaluating the situation. No estimates are available for completion of work to correct the problem. The condition of the control structure is also in question as the drawdown gates were described as appearing to be rusted and inoperable in the last dam inspection conducted on April 26, 2011 by the DOTD. Erosion concerns in the outflow channel forced the cancellation of the drawdown started in 2012. The integrity of the LA 2 roadbed was threatened by the outflow when the control gates were opened to dewater Black Bayou.

## RECOMMENDATIONS

1. Replacement of the Black Bayou water control and outflow structures is recommended to facilitate water fluctuation.

2. When control structure repairs allow and with support of the Black Bayou Watershed District, a drawdown should be conducted for aquatic vegetation control and reduction of organic substrate. Timing should mimic the natural fall low water cycle with control gates to be opened August 15 to allow for a 5 foot reduction in water level. A 90 day drawdown period should commence when the target level of 5 foot below pool stage is achieved. Control gates should be closed and Black Bayou Lake should be allowed to refill upon completion of the 90 day period.

3. During the low water period, an evaluation of the lake bed should be conducted to determine drainage patterns including a search for isolated waters containing aquatic vegetation. When such areas are found, total water volume treatments of Galleon® (penoxsulam) or Avast SC® (fluridone) should be. Galleon® should be used at a concentration of 15 ppb, while Avast SC® should be applied at 20 – 45 ppb. To reduce cost, Galleon should be used where water hyacinth is present. Avast should be used where water hyacinth is absent. Galleon and Avast SC® require minimum contact times of 60 and 30 days respectively.

4. Triploid grass carp (TGC) should be stocked in winter 2012/2013 at a rate of 5 fish per vegetated acre. Ten to twelve inch fish should be utilized to reduce mortality due to predation.

5. A type map survey will be conducted during the summer months to assess the effectiveness of control efforts. Additional carp will be applied as determined necessary by sampling results and with approval of the Black Bayou Watershed

District.

6. Foliar herbicide applications will be conducted by LDWF spray crews for control noxious emergent and floating vegetation on Black Bayou Lake as needed.

7. Standardized sampling will continue as scheduled to monitor fish populations. Results from standardized sampling will be used to determine future management recommendations.